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REDUCTION MECHANISM USING GEARS

Shinichi Arai

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REDUCTION MECHANISM USING GEARS

[Haguruma niyoru kensoku kiko]

Inventor: Shinichi Arai

Applicant: Hitachi, Ltd.

[There are no amendments to this patent.]

Claim

A type of reduction mechanism using gears characterized by the fact that in the reduction mechanism using gears, together with each of the gears having the rigidity to transfer rotating torque and position, a gear having the same module pitch as that of the gear with rigidity and different from said gear having rigidity by having no backlash or having a larger gear thickness as contrary to said gear having rigidity and made of a material having good elasticity is prepared, and the two gears are set side-by-side to eliminate backlash in engagement of the gears.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a type of reduction mechanism using gears characterized by the fact that in a rotating torque and position transmission mechanism, together

with each conventional gear having rigidity, a gear made of an elastic material is set side-by-side so as to eliminate the backlash of the transmission mechanism.

Prior art

In the prior art, in order to eliminate the backlash of gear, as shown in Figure 1, double gears are adopted for each gear, and a spring is used to press to one direction. As another scheme shown in Figure 2, for a bevel gear unit, spring tension is used to press to eliminate the backlash. However, for said method, the structure of the mechanism is complicated, so that it can hardly be adopted in the device that requires a lightweight reduction mechanism, such as a robot. Especially, as shown in Figure 2, the aforementioned scheme usually cannot be adopted for the normally engaged gears.

Objective of the invention

The objective of the present invention is to provide a type of reduction mechanism using gears characterized by the fact that it is free of backlash and can be used in various forms of gear transmission mechanisms.

Summary of the invention

According to the present invention, each gear is made of a combination of two gears having the same tooth shape and made of a material with the conventional rigidity for one of them and a wear-proof material with good elasticity for the other. One of said gears plays the conventional role in transmitting rotating torque and position, while the other eliminates the backlash by making the tooth shape deformed in the engagement state all the time, so that it can eliminate play.

Application examples

In the following, an explanation will be given regarding an application example of the present invention with reference to Figure 3. First of all, there is a conventional gear pair (11, 12). Said gears are made of the conventional material, such as S45C or the like in the conventional tooth shape. Said gears (11, 12) have the tooth thickness and central distance with a conventionally necessary backlash. Now, for said gear (12), gear (13) made of an elastic material with a larger tooth thickness than that of gear (12) is integrated with said gear (12) to form a gear. Said gear (13) has its teeth slightly deformed to eliminate the backlash with respect to gear (11). Because gears (11) and (12) are rigid gears, they can perform transmission of the rotating torque and rotating position as a conventional pair of gears. On the other hand, since gear (13) has a larger tooth thickness, as gears (11), (12) are engaged, it comes in close contact and rotates

before gear (12) is engaged with gear (11). Consequently, backlash of the engagement of the gears is eliminated, and the transmission torque does not change abruptly. Instead, smooth transmission can be performed. Also, the rotating position precision is limited to a certain range defined by gears (11), (12).

As shown in Figures 4a-D, the method of the present invention can be adopted for various tooth shapes. As shown in Figure 2, for bevel gears, too, by forming elastic material at the portion indicated by oblique lines using the aforementioned method, it is possible to eliminate backlash. Also, the present invention has a characteristic feature that it can be adopted for skew bevel gears, double helical gears, and other gears that used to be unable to get rid of backlash in the prior art.

Effects of the invention

The present invention has the following effects:

1) The mechanism can be made simpler.

2) The conventional gears made of rigid material can be set with normal engagement.

3) This method can be adopted also for gears having different tooth shapes to eliminate backlash.

4) Because the gear having good elasticity is touched first, the noise level of the gears can be reduced.

Brief description of the figures

Figure 1 is a 3-way drawing of a backlash eliminating mechanism of spur gears in the prior art. Figure 2 is a front view of the tension mechanism using a dish spring for bevel gears. Figure 3 is a diagram illustrating the principle of the double gears in the present invention. Figure 4 is a diagram illustrating the various types of gears for which the present invention can be adopted.

1, 2, 3	Spur gear
4	Spring
6, 7	Bevel gear
8	Dish spring
11, 12	Gear made of rigid material
13	Gear made of elastic material

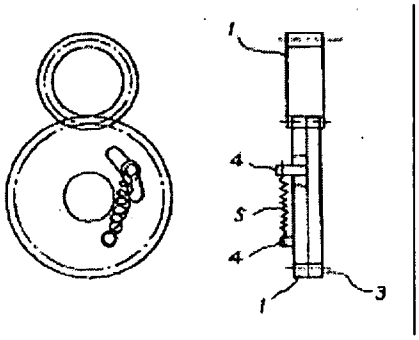


Figure 1

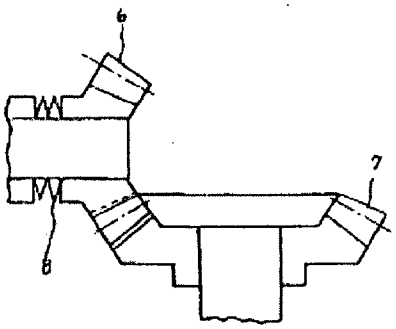


Figure 2

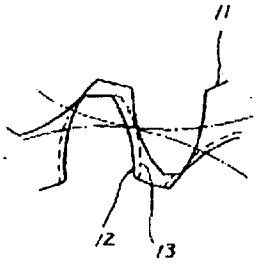
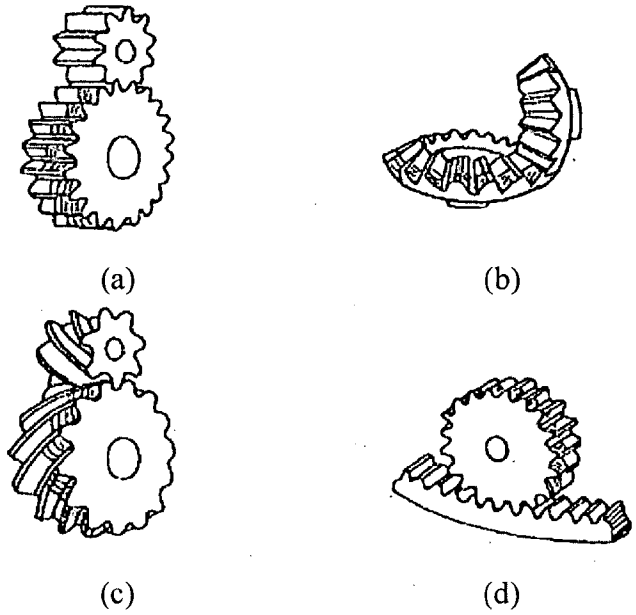


Figure 3



(a) (b)

(c) (d)

Figure 4